

JG07 Rec'd PCT/PTO 15 FEB 2007

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| FORM PTO-1390 (REV 10-94) | | U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE | | DOCKET #: 4070-63PUS |
| TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371 | | | | |
| | | | | U.S. APPLICATION NO. (If known, see 37 CFR 1.5) 10/069039 |
| INTERNATIONAL APPLICATION NO. PCT/DE00/03155 | | INTERNATIONAL FILING DATE 07 September 2000 | | PRIORITY DATE CLAIMED 20 September 1999 |
| TITLE OF INVENTION Fluorescent Film | | | | |
| APPLICANT(S) FOR DO/EO/US Jürgen CONRADY | | | | |
| <p>Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:</p> <ol style="list-style-type: none"> <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under <u>35 U.S.C. 371</u>. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371 <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1). <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) <ol style="list-style-type: none"> <input checked="" type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau). <input type="checkbox"/> has been transmitted by the International Bureau. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US) <input checked="" type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)). <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) <ol style="list-style-type: none"> <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). <input type="checkbox"/> have been transmitted by the International Bureau. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. <input type="checkbox"/> have not been made and will not be made. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). <p>Items 11. to 16. Below concern other document(s) or information included:</p> <ol style="list-style-type: none"> <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. <input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. <input checked="" type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. <input type="checkbox"/> A substitute specification. <input type="checkbox"/> A change of power of attorney and/or address letter. <input type="checkbox"/> Other items or information (<i>specify</i>): PCT Publication Sheet, Int'l Preliminary Examination Report, Int'l Search Report, PCT Request, Drawings | | | | |

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|---|--------------|--|--|---|----------|
| U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.5) <div style="font-size: 1.5em; font-weight: bold; margin-top: 10px;">10/069039</div> | | INTERNATIONAL APPLICATION NO. PCT/DE00/03155 | | ATTORNEY'S DOCKET NUMBER 4070-63PUS | |
| 17.[x]The following fees are submitted: | | | | | |
| Basic National Fee (37 CFR 1.492(a)(1)-(5)): Search Report has been prepared by the EPO or JPO\$890.00 International preliminary examination fee paid to USPTO (37 CFR 1.482).....\$710.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)).....\$740.00 Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO.....\$1040.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4)\$100.00 | | | | | |
| ENTER APPROPRIATE BASIC FEE AMOUNT = | | | | \$ | 890.00 |
| Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)). | | | | \$ | -0- |
| Claims | Number Filed | Number Extra | Rate | | |
| Total Claims | 29 - 20 = | 9 | x \$18.00 | \$ | 162.00 |
| Independent Claims | 3 - 3 = | 0 | x \$84.00 | \$ | -0- |
| Multiple dependent claim(s) (if applicable) | | | + \$280.00 | \$ | -0- |
| TOTAL OF ABOVE CALCULATIONS = | | | | \$ | 1052.00 |
| Reduction of 1/2 for filing by small entity, if applicable. | | | | \$ | 526.00 |
| SUBTOTAL = | | | | \$ | 526.00 |
| Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)). | | | | \$ | -0- |
| TOTAL NATIONAL FEE = | | | | \$ | 526.00 |
| Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by the appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property | | | | \$ | 40.00 |
| TOTAL FEES ENCLOSED | | | | | \$566.00 |
| Amount to be refunded: | | | | | \$ |
| charged: | | | | | \$ |
| a. [x] Two checks in the amount of \$526.00 and \$40.00 to cover the above fees is/are enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. 03-2412 in the amount of \$_____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. [x] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 03-2412. A duplicate copy of this sheet is enclosed. | | | | | |
| NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status. | | | | | |
| SEND ALL CORRESPONDENCE TO: Thomas C. Pontani Cohen, Pontani, Lieberman & Pavane 551 Fifth Avenue, Suite 1210 New York, New York 10176 | | | <div style="text-align: center;"> </div> F. Brice Faller Registration Number: 29,532 February 15, 2002 Tel: (212) 687-2770 | | |

10/069001
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By Express Mail # EL831449357US · February 15, 2002

Attorney Docket # 4070-63PUS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re National Phase PCT Application of

Jürgen CONRADY

International Appln. No.: PCT/DE00/03155

International Filing Date: 07 September 2000

For: Fluorescent Film

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents

Washington, D.C. 20231

BOX PCT

S I R:

Prior to examination of the above-identified application please amend the application as follows:

In the Specification:

Please delete the subtitle at page 1, line 5, and insert the following subtitles:

--[Description] BACKGROUND OF THE INVENTION

1. Field of the Invention--

Please insert at page 1, after line 9, the following subtitle:

--2. Description of the Related Art--

Please insert at page 4, after line 13, the following subtitle:

--SUMMARY OF THE INVENTION--

Please replace the paragraph beginning at page 4, line 14, with the following rewritten paragraph:

--Therefore, the object of the invention is to provide a fluorescent film which can be produced in sufficient thickness while exhibiting good thermal stability, so that it is suitable for use in low-pressure discharge lamps. Another object is to provide a flexible irradiation arrangement which can be used for a wide variety of applications. Another object is to provide a method for producing a fluorescent film of this kind.--

Please replace the paragraph beginning at page 4, line 21, with the following rewritten paragraph:

According to the invention, the fluorescent film is formed as a silicone elastomer in which luminescent particles are embedded. The film is produced by the steps of (a) mixing a hydroxyl polydiorganosiloxane with an organohydrogen siloxane, (b) adding luminescent particles, and (c) generating a chemical reaction by means of a platinum catalyst at room temperature.

Please insert at page 7, line 13, the following subtitle:

--BRIEF OF THE DRAWINGS--

Please insert at page 7, line 28, the following subtitle:

--DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS--

In the Claims:

Cancel claims 1-30 and enter new claims 31-59 as follows:

--31. A fluorescent film formed as a silicone elastomer in which luminescent particles are embedded, wherein the film is produced by the following steps:

- (a) mixing a hydroxyl polydiorganosiloxane with an organohydrogen siloxane,
- (b) adding luminescent particles, and
- (c) generating a chemical reaction by means of a platinum catalyst at room temperature.--

--32. A fluorescent film according to claim 31, wherein the hydroxyl polydiorganosiloxane comprises various polymers with a minimum viscosity of 1000 centipoise at 25°C.--

--33. A fluorescent film according to claim 32, wherein the hydroxyl polydiorganosiloxane is formed as at least one of hydroxyl polydimethylsiloxane, its copolymers, phenylmethylsiloxane and polymethyl-3,3,3-trifluoropropylsiloxane.--

--34. A fluorescent film according to claim 32 wherein the organohydrogen siloxane is formed as silicone with at least two silicon-bonded hydrogen atoms per molecule.--

--35. A fluorescent film according to claim 34 wherein the organohydrogen siloxane comprises one of homopolymers, copolymers, and mixtures thereof.--

--36. A fluorescent film according to claim 31 wherein the platinum catalyst comprises one of a platinum chloride, platinum salts, and chloroplatinic acid.--

--37. A fluorescent film according to claim 36 wherein the chloroplatinic acid is in the form of one of a hexahydrate and anhydrous chloroplatinic acid.--

--38. A fluorescent film according to claim 31 wherein the fluorescent film has a thickness between 10 and 800 μm .--

--39. A fluorescent film as in claim 31 wherein the luminescent particles have a surface density which is between 1 and 20 mg/cm^2 .--

--40. A fluorescent film according to claim 31 wherein the luminescent particles have a grain size which is between 5 and 15 μm .--

--41. An irradiation arrangement comprising
a low-pressure discharge lamp with an enveloping body which is transparent to UVC, and electrodes which can be contacted from the outside projecting into the enveloping body, and

a fluorescent film formed as a silicone elastomer in which luminescent particles are embedded, wherein the film is produced by the following steps:

- (a) mixing a hydroxyl polydiorganosiloxane with an organohydrogen siloxane,
- (b) adding luminescent particles, and
- (c) generating a chemical reaction by means of a platinum catalyst at room temperature.--

--42. An irradiation arrangement according to claim 41, wherein the fluorescent film is applied to an outer surface of the enveloping body.--

--43. An irradiation arrangement according to claim 42 wherein fluorescent films with different doping are applied to the enveloping body.--

--44. An irradiation arrangement according to claim 41 further comprising a displacement body arranged in the enveloping body, so that channels are formed between the enveloping body and displacement body.--

--45. An irradiation arrangement according to claim 44, wherein the displacement body is constructed as a closed hollow body.--

--46. An irradiation arrangement according to claim 44 further comprising a reflector layer applied to an outer surface of the displacement body.--

--47. An irradiation arrangement according to claim 44 wherein the displacement body comprises a material that is transparent to radiation emitted by the discharge lamp.--

--48. An irradiation arrangement according to claim 44 wherein the low-pressure discharge lamp comprises a fastening arrangement for receiving displacement bodies with different geometric shapes.--

--49. An irradiation arrangement according to claim 44 wherein the displacement body is shaped irregularly, so that the channel between the enveloping body and the displacement body has different widths.--

--50. An irradiation arrangement according to claim 41 wherein the fluorescent film is fitted to the enveloping body in the form of an interchangeable frame.--

--51. An irradiation arrangement according to claim 50, wherein the interchangeable frame comprises a dispensing roller and a take-up roller on which the fluorescent film is wound up, whereby films with different doping can be fitted to the enveloping body.--

--52. An irradiation arrangement for therapeutic purposes according to claim 41 wherein the fluorescent film is wound around the part of a body to be treated in the manner of a bandage.--

--53. A method for producing a fluorescent film formed as a silicone elastomer in which luminescent particles are embedded, comprising the following steps:

- (a) mixing a hydroxyl polydiorganosiloxane with an organohydrogen siloxane,
- (b) adding luminescent particles, and
- (c) generating a chemical reaction by means of a platinum catalyst at room temperature.--

--54. A method for producing a fluorescent film according to claim 33, wherein the hydroxyl polydiorganosiloxane comprises various polymers with a minimum viscosity of 1000 centipoise at 25°C.--

--55. A method for producing a fluorescent film according to claim 54, wherein the hydroxyl polydiorganosiloxane is formed as at least one of hydroxyl polydimethylsiloxane, its copolymers, phenylmethylsiloxane, and polymethyl-3,3,3-trifluoropropylsiloxane.--

--56. A method for producing a fluorescent film according to claim 53 wherein the organohydrogen siloxane is formed as silicone with at least two silicon-bonded hydrogen atoms per molecule.--

--57. A method for producing a fluorescent film according to claim 56 wherein the organohydrogen siloxane comprises one of homopolymers, copolymers, and mixtures thereof.--

--58. A method for producing a fluorescent film according to claim 53 wherein the platinum catalyst comprises one of a platinum chloride, platinum salts, and chloroplatinic acid.--

--59. A method for producing a fluorescent film according to claim 58, wherein the chloroplatinic acid is in the form one of a hexahydrate and anhydrous chloroplatinic acid.--

In the Abstract:

Please delete the Abstract and insert the "Abstract of the Disclosure" hereto.


REMARKS

The specification has been amended to add headings and improve grammar to place the application in better form for examination and to eliminate multiple dependency from the present claims. Other changes are for consistency with other parts of the specification and do not represent new matter. Newly submitted claims are believed to comply with 35 U.S.C. §112.

Early consideration and action on the merits are solicited.

Any additional fees or charges required at this time in connection with the application may be charged to our Patent and Trademark Office Deposit Account No. 03-2412.

Respectfully submitted,
COHEN, PONTANI, LIEBERMAN & PAVANE

By: 
F. Brice Faller
Reg. No. 29,532
551 Fifth Avenue, Suite 1210
New York, N.Y. 10176
(212) 687-2770

15 February 2002

AMENDMENTS TO THE SPECIFICATION AND CLAIMS SHOWING CHANGES

In the Specification:

The paragraph beginning at page 4, line 14, has been rewritten as follows:

--Therefore, the [technical problem upon which the invention is based] object of the invention is to provide a fluorescent film which can be produced in sufficient thickness while exhibiting good thermal stability, so that it is suitable for use in low-pressure discharge lamps. Another [technical problem consists in providing] object is to provide a flexible irradiation arrangement which can be used for a wide variety of applications. Another [technical problem consists in providing] object is to provide a method for producing a fluorescent film of this kind.--

The paragraph beginning at page 4, line 21, has been rewritten as follows:

[The technical problem is solved as set forth in the features of patent claims 1, 12 and 24. Further advantageous constructions of the invention follow from the subclaims.] According to the invention, the fluorescent film is formed as a silicone elastomer in which luminescent particles are embedded. The film is produced by the steps of (a) mixing a hydroxyl polydiorganosiloxane with an organohydrogen siloxane, (b) adding luminescent particles, and (c) generating a chemical reaction by means of a platinum catalyst at room temperature.

ABSTRACT OF THE DISCLOSURE

A fluorescent film for use with a low-pressure discharge lamp is formed as a silicone elastomer in which luminescent particles are embedded. The film is formed by the steps of (a) mixing a hydroxyl polydiorganosiloxane with an organohydrogen siloxane, (b) adding luminescent particles, and (c) generating a chemical reaction by means of a platinum catalyst at room temperature.

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FLUORESCENT FILM

5 Description

The invention is directed to a fluorescent foil or film, particularly for use with a low-pressure discharge lamp, a method for producing the fluorescent film and an irradiation arrangement with the fluorescent film.

10 Light absorption through the skin causes tissue changes by influencing the neuronal, lymphatic, vascular and immune systems. This brings about analgesic, antiinflammatory, antiedematous effects and stimulates healing of wounds. A considerable increase in fibroblasts of scar tissue was found under irradiation by red light (660 nm, 2.4-4 J/cm²) (C. Webb; M. Dyson, et al., Lasers in Surgery and Medicine, 22(5), 294-30, (1998)). When peripheral lymphocytes were irradiated by an He-Ne laser with irradiation doses of between 28 and 112 J/m², there was an increase in RNA synthesis after stimulation of the lymphocytes by cytohesoagglutinin (N. K. Smol'yaninova, T. I. Karu, et al., Biomedical Science, 2(2), 121-126 (1991)). With bone injuries, a doubling of calcium incorporation at the injury site was observed after He-Ne laser irradiation (T. Yaacoby, L. Maltz, et al., Calcified Tissue International 59(4), 297-300, (1996)). Various chronic joint diseases such as gonarthrosis, LWS arthrosis and algodystrophy in hemiplegic stroke patients were found to be positively affected by He-Ne laser irradiation in over 400 patients (S. Giavelli, G. Fava, et al., Radiologia Medica, 95(4), 303-309, (1998)).

25 The release of interleukin-1-alpha and interleukin-8 has been discussed as a possible cause for the positive effects (H. S. Yu, K. L. Chang, et al., Journal of Investigative Dermatology, 107(4), 593-596, (1996)). Irradiation at 1.5 J/cm² resulted in a concentration-dependent simulation of interleukin-1-alpha production and corresponding mRNA expression. Since these cytokines stimulate both mobility and proliferation of keratinocytes, it is likely that these mechanisms directly promote wound healing. Further, models of photonic cellular energy transfer in relation to the respiratory chain are being discussed (L. Wilden, R. Karthein, Journal of Clinical

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Laser Medicine and Surgery, 16(3), 159-165, (1998). The biochemical models of cellular energy transfer take into account only the typical corpuscular aspect of electrons as responsible for energy transfer and ignore the wave-particle dualism of electrons in energy transfer. The light of the red and near-infrared spectra closely corresponds to characteristic energy planes and absorption rates of important components of the respiratory chain. For example, an increase in mitochondrial adenosine triphosphate production is brought about in this way. Interactions in the red and near-IR ranges can be explained on the basis of this interaction.

Photobiological effects in the non-UV range based on an interaction between endogenic or exogenic chromophores in the skin are becoming increasingly important because therapeutic effects can be influenced by means of suitable radiation sources in certain inflammatory skin diseases and, for example, impairment of wound healing in diabetes mellitus.

Because their efficiency is usually better than that of high-pressure lamps or temperature radiators, low-pressure discharge lamps are used increasingly in many technical fields, especially when high light energy efficiency is required. Single-base or double-base low-pressure discharge lamps are known depending on the field of use. Further, these low-pressure discharge lamps can be constructed with or without luminescent material and with different gases. However, all embodiment forms have in common that the light energy transfer increases as the diameter of the enveloping body decreases.

According to one model calculation, the light energy density corresponds to approximately one fourth of the quotient of the column capacity and projection surface. This means that the theoretical maximum value of a 38-mm low-pressure discharge lamp is approximately 45 mW/cm^2 . In a 26-mm low-pressure discharge lamp, the light energy density increases to approximately 50 mW/cm^2 . Theoretical light energy densities of 100, 125 and 170 mW/cm^2 result for lamp diameters of 16 mm, 12 mm and 8 mm. The increased luminous density of small radiators is utilized, for example, in the construction of compact lamps having, e.g., a wall diameter of 12 mm. Fluorescent tubes with a diameter of 8 mm have been in use for some years for effect illumination. They surpass compact lamps with respect

to luminous density, but the greatest available lengths are only about 30 cm.

In spite of the increased light output, however, the reduction in lamp geometry has grave disadvantages. A large number of lamps with an equally large number of expensive ballast devices are required in order to generate radiating surfaces. The lengthening of the lamps is subject to plasma-physical limits because the high ignition voltages that are required for large lengths represent a considerable expenditure. Added to this is the manufacturing cost itself, i.e., elutriation, pumping and basing of each individual fluorescent tube.

Therefore, low-pressure discharge lamps with external or internal reflectors are usually used for surface illumination; for example, light energy densities of between 22 and 28 mW/cm² at an irradiation level of 100W can be achieved. However, the light energy densities that can actually be achieved are considerably lower than in theory.

The basic problem in conventional low-pressure discharge lamps with fluorescent material and electron-emitting electrodes is the limited period of use, especially with very high lamp outputs.

The principal reason for this is that reaction components of the electrode burnup react chemically with the luminescent coating, which leads to an aging process. Another problem is that the reaction components of the electrode burnup and of the mercury vapor react with alkaline compounds of the glass tube to form various amalgams. This results in blackening of the tube, accelerated reduction of light output and sometimes in a dramatic reduction in the useful life of the lamp. Since the useful life is already sharply limited due to the aging process of the luminescent coating, the use of expensive alkali-free fused silica glasses has so far been unprofitable. For medical high-power radiators, the useful life may only amount to 48 hours, for example.

Experimental application of luminescent material to the outside of the low-pressure discharge lamp was not successful because the application of luminescent material in a non-inert atmosphere leads to a photochemical oxidative degradation of the hygroscopic luminescent material.

US 5,717,282 discloses a Braun tube for monitor production in which

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a silica-containing paint with luminescent materials which is produced by a sol-gel process is applied to the outer side of the monitor. The thickness of this phosphor coating is limited to about 0.5 μm because, otherwise, cracks would result from the extensive shrinkage of the inorganic network. However, a layer of this thickness is too thin and does not have sufficient thermal stability for use in a low-pressure discharge lamp at higher outputs.

US 5,731,658 discloses a liquid crystal display in which a phosphor coating is applied to the inner boundary walls. The phosphor coating comprises a UV-transparent carrier material and phosphor. Silicone oxide or organosilicates, particularly ethyl silicate, methyl silicate or isopropyl silicate, are suggested as carrier materials. The coating thickness that can be achieved in this way is also too small to allow for adequate embedding of luminescent material for a low-pressure discharge lamp.

Therefore, the technical problem upon which the invention is based is to provide a fluorescent film which can be produced in sufficient thickness while exhibiting good thermal stability, so that it is suitable for use in low-pressure discharge lamps. Another technical problem consists in providing a flexible irradiation arrangement which can be used for a wide variety of applications. Another technical problem consists in providing a method for producing a fluorescent film of this kind.

The technical problem is solved as set forth in the features of patent claims 1, 12 and 24. Further advantageous constructions of the invention follow from the subclaims.

On one hand, films of sufficient thickness with a sufficiently high concentration of luminescent material can be produced in that the fluorescent film is formed as silicone elastomer in which the luminescent particles are embedded. Further, the luminescent particles are crosslinked so as to be airtight and free of moisture in the silicone elastomer, so that they are not subjected to an aging process. Silicone elastomers are UVC-transparent and have considerable advantages over alternative UVC-transparent carrier materials. While sapphire and quartz are transparent to UVC, it is not possible to use inorganic luminescent materials as a

dopant in quartz windows for reasons pertaining to the chemistry of luminescent material. Sapphire dopant is ruled out from the start because of the extreme melting temperatures. Other plastics such as acrylates, transparent PVC or Teflon do not have sufficient thermal stability. However, the silicone elastomers are stable up to 250°C and do not require emollients or other volatile substances that could evaporate. Because of the extended life of the luminescent material due to the fact that luminescent material can be arranged outside of the charging vessel and, therefore, no reaction can occur with the electrode burnup, the use of alkali-free fused silica is also acceptable, which further increases the life and quality of the low-pressure discharge lamp.

In a preferred embodiment form, the silicone elastomer can be produced by a method in which a hydroxyl polydiorganosiloxane with an organohydrogen siloxane to which the luminescent material particles are added is in crystalline form. By means of a platinum catalyst, a chemical reaction can be generated at room temperature leading to a complete crosslinking in which the luminescent material particles are not loaded due to the low process temperatures.

Hydroxyl polydiorganosiloxane comprising various polymers with a minimum viscosity of 1000 centipoise at room temperature has proven particularly suitable, wherein the hydroxyl diorganosiloxane is preferably formed as hydroxyl polydimethylsiloxane, its copolymers, phenylmethylsiloxane and/or polymethyl-3,3,3-trifluoropropylsiloxane.

The organohydrogen siloxane is preferably formed as silicone with at least 2 silicon-bonded hydrogen atoms per molecule, particularly homopolymers, copolymers or mixtures thereof.

The platinum catalyst can comprise a platinum salt, particularly platinum chloride or chloroplatinic acid, the latter preferably being used as a hexahydrate or in anhydrous form.

The thickness of the fluorescent film is preferably between 10 and 800 μm , wherein the surface density is between 1 and 20 mg/cm^2 . A thickness between 100 and 600 μm with a surface density between 3 and 6 mg/cm^2 appears particularly advantageous.

An irradiation arrangement with very flexible handling can be constructed by arranging the fluorescent film outside the discharge space. For one, the life of the irradiation arrangement depends only upon the low-pressure discharge lamp itself, particularly its electrodes, since the fluorescent films themselves can easily be exchanged at any time. Further, this enables outfitting with differently doped fluorescent films in a very simple manner, so that different spectral ranges and irradiation intensities can be adjusted with one irradiation arrangement.

In a preferred embodiment form, a displacement body is arranged in the enveloping body, so that channels are formed between the enveloping body and displacement body, so that the low-pressure discharge lamp can be constructed so as to be very long without requiring very high ignition voltages, since there is still a sufficiently large plasma volume. On the other hand, the emitted light energy density increases in the channels between the enveloping body and the displacement cylinder because the channel acts like a low-pressure discharge lamp with a small diameter. When the enveloping body and displacement body are constructed as cylinders, a cylindrical jacket is formed as a channel which can be visualized as many low-pressure discharge lamps of small diameter arranged radially with respect to one another.

In a preferred embodiment form, the displacement body is constructed as a closed hollow body which is particularly advantageous with respect to weight.

A reflector layer can also be arranged on the outer side of the displacement body or the displacement body can comprise a material which is transparent to the emitted radiation. Further, it is also possible to combine the steps.

In order to produce low-pressure discharge lamps with different light energy densities, a fastening device can be used to receive different displacement bodies. For production, different diameters of the displacement body are used depending on the desired light energy density.

In certain applications, it is desirable to obtain uniform light energy density over the entire irradiation surface. For sunbathing, for example, a stronger radiation may be desired only in the head area. This can easily be achieved, for

example, in that the displacement body only extends over the head area or in that the displacement body has different diameters in longitudinal direction. A further possibility consists in coating the displacement body with a reflector layer at desired places.

5 The possibility of operating different screen-like irradiation films with different luminescent materials with one and the same light source results in a very multifaceted therapeutic and irradiation system. The treating physician can treat a different patient or replace an old silicone module in a very short amount of time, i.e., in a minute, by changing the silicone module similar to the use of a large
10 optical filter.

 The invention will be described more fully in the following with reference to a preferred embodiment example.

 Fig. 1 shows a schematic top view of an irradiation arrangement;

 Fig. 2 shows a schematic partial top view of a low-pressure discharge
15 lamp;

 Fig. 3 shows spectra of different fluorescent films;

 Fig. 4 is a graph showing intensities over film thickness;

 Fig. 5 is a graph showing intensities over the surface density of the luminescent particles; and
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 Fig. 6 shows spectral absorption curves of a fluorescent film with variation in time.

 Fig. 1 shows a schematic top view of an irradiation arrangement 1 for
25 cosmetic and/or therapeutic treatment of a patient 2. The irradiation arrangement 1 comprises at least one low-pressure discharge lamp 3, a reflector screen 4 and a
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fluorescent film 5 which is supported so that it can be wound on and off by means of rollers 6. The distances shown between the low-pressure discharge lamp 3 and the reflector screen 4 and fluorescent film 5 are not true to scale. The UV radiation generated in the discharge program of the low-pressure discharge lamp 3 exits isotropically from the UV-transparent enveloping tube 7 of the low-pressure discharge lamp 3 and impinges in part directly on the fluorescent film 5. Another portion of the radiation impinges on the reflector layer 4 and is partially reflected from the latter to the fluorescent film 5. The UV radiation impinging on the fluorescent film 5 partially excites the luminescent particles embedded in the fluorescent film 5 which then emit in the desired spectral range and irradiate the patient. Various types of irradiation arrangements 1 can be realized by means of the rollers 6 onto which a portion of the fluorescent film 5 is wound.

In the simplest case, the rollers 6 extend over the full height of the irradiation arrangement 1 on which a uniformly doped fluorescent film 5 is wound. Then, in case the luminescent material located in the wound-off area should be aged, this area is wound up and an unused portion of fluorescent film 5 is wound off. Further, it is also possible to use fluorescent films 5 with different doping, so that a determined region of the fluorescent film 5 with the appropriate doping depending on the desired irradiation therapy is wound off. Further, it is possible to provide different rollers 6 along the height, so that the variation described above can also be carried out for different body parts.

Fig. 2 shows a preferred embodiment form of a low-pressure discharge lamp 3 in a schematic partial top view. The low-pressure discharge lamp 3 comprises an enveloping body 7, a base 8 hermetically closing the enveloping body 7, an incandescent spiral filament 9 with contacts 10 guided through the base 8 and a displacement body 11 constructed as a hollow body. The displacement body 11 is arranged so as to be rotationally symmetric with respect to the enveloping body 7 and at a distance from the spiral filament 9. A reflecting coating 12 is arranged on the outer side of the displacement body 11. A rotationally symmetric channel 13 with the low-pressure plasma is formed between the enveloping body 7 and the displacement body 11, wherein mercury with argon is preferably used as filling

material. Electrons are emitted via the spiral filament 9 by thermal emission and are accelerated by an external electrical field. This brings about an interaction with the mercury atoms in the channel 13. The electrons of the mercury are excited by the interaction and give off the absorbed energy again by means of spontaneous emission of photons. The resulting UV radiation then exits the enveloping body 7 directly or after being reflected at the coating 12 and excites the luminescent particles in the fluorescent film arranged outside the low-pressure discharge lamp 3. Fig. 3 shows the intensities of different fluorescent films with different film thickness and different dopant concentrations for a luminescent material LS 635. The fluorescent films 5a-e have the following parameters:

| Film | Film thickness (mm) | Doping (g/cm ³) | Surface density of the luminescent material particles (mg/cm ³) |
|------|---------------------|-----------------------------|---|
| 5a | 0.2 | 0.2 | 4 |
| 5b | 0.55 | 0.1 | 5.5 |
| 5c | 0.6 | 0.2 | 12 |
| 5d | 0.25 | 0.5 | 12.5 |
| 5e | 0.65 | 0.3 | 19.5 |

Figs. 4 and 5 show the fluorescent films 5a-e with a standardized intensity over the film thickness and surface density of the luminescent particles. As will be seen particularly from Fig. 5, there are high intensities in the range of 4-6 mg/cm² surface density of the luminescent particles. Further, it will be seen, referring to fluorescent film 5e, for example, that especially thick films with high doping do not lead to high intensities, which is presumably to be credited to the vignetting effect and self-excitation. The present measurements lead to the conclusion that an optimum exists with respect to film thickness and surface density, presumably dependent on the luminescent material, which must presumably be empirically determined. However, it is obvious from Fig. 5 that the essential parameter is the surface density of the luminescent particles because films 5a and 5b; 5c and 5d behave virtually identically in spite of considerable differences in

thickness.

Therefore, in principle, thin films appear more suitable because they require considerably less material for the same intensity, but their temperature stability and life compared with thicker films must be studied in greater depth.

Fig. 6 shows the spectral UV absorption curve 20 of a fluorescent film with a thickness of 530 μm . Further, the UV absorption curve 21 of this film after 5 days continuous loading by a 54W UV lamp at a distance of 2 cm is 60°C and the UV absorption curve 22 after 7 days of continuous loading by a 54W UV lamp is 60°C, where the film lay directly on the enveloping tube. These curves are an impressive demonstration of the long life of the film, whose absorption curve also remains virtually unchanged even with continuous loading.

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Patent claims

1. Fluorescent film, particularly for use with a low-pressure discharge lamp, characterized in that the fluorescent film (5) is formed as a silicone elastomer in which the luminescent particles are embedded.
2. Fluorescent film according to claim 1, characterized in that the silicone elastomer can be produced by the following process:
 - a) mixing a hydroxyl polydiorganosiloxane with an organohydrogen siloxane,
 - b) adding luminescent particles, and
 - c) generating a chemical reaction by means of a platinum catalyst at room temperature.
3. Fluorescent film according to claim 2, characterized in that hydroxyl polydiorganosiloxane comprises various polymers with a minimum viscosity of 1000 centipoise at 25°C.
4. Fluorescent film according to claim 3, characterized in that the hydroxyl polydiorganosiloxane is formed as hydroxyl polydimethylsiloxane, its copolymers, phenylmethylsiloxane and/or polymethyl-3,3,3-trifluoropropylsiloxane.
5. Fluorescent film according to claim 3 or 4, characterized in that the organohydrogen siloxane is formed as silicone with at least 2 silicon-bonded hydrogen atoms per molecule.
6. Fluorescent film according to claim 5, characterized in that the organohydrogen siloxane comprises homopolymers, copolymers or mixtures thereof.
7. Fluorescent film according to one of claims 2 to 6,

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characterized in that the platinum catalyst comprises a platinum chloride, platinum salts or chloroplatinic acid.

8. Fluorescent film according to claim 7, characterized in that the chloroplatinic acid is in the form of a hexahydrate or in anhydrous form.

9. Fluorescent film according to one of the preceding claims, characterized in that the thickness of the fluorescent film (5) is between 10 and 800 μm .

10. Fluorescent film according to one of the preceding claims, characterized in that the surface density of the luminescent particles is between 1 and 20 mg/cm^2 .

11. Fluorescent film according to one of the preceding claims, characterized in that the grain size of the luminescent particle is between 5 and 15 μm .

12. Irradiation arrangement, comprising a low-pressure discharge lamp with an enveloping body which is transparent to UVC, electrodes which can be contacted from the outside projecting into the enveloping body, and a luminescent coating, characterized in that the luminescent coating is formed as a fluorescent film (5) formed of a silicone elastomer in which the luminescent particles are embedded.

13. Irradiation arrangement according to claim 12, characterized in that the fluorescent film (5) is applied to the outer side of the enveloping body (7).

14. Irradiation arrangement according to claim 13, characterized in that fluorescent films (5) with different doping are applied to the enveloping body (7).

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15. Irradiation arrangement according to one of claims 12 to 14, characterized in that a displacement body (11) is arranged in the enveloping body (7), so that channels (13) are formed between the enveloping body (7) and displacement body (11).

16. Irradiation arrangement according to claim 15, characterized in that the displacement body (11) is constructed as a closed hollow body.

17. Irradiation arrangement according to one of claims 15 or 16, characterized in that a reflector layer (12) is applied at least partially to the outer side of the displacement body (11).

18. Irradiation arrangement according to one of claims 15 to 17, characterized in that the displacement body (11) comprises a material that is transparent to the emitted radiation.

19. Irradiation arrangement according to one of claims 15 to 18, characterized in that the low-pressure discharge lamp (3) is constructed with a fastening arrangement for receiving displacement bodies (11) with different geometric shaping.

20. Irradiation arrangement according to one of claims 15 to 19, characterized in that the displacement body (11) is shaped irregularly, so that the channel (13) between the enveloping body (7) and the displacement body (11) has different widths along the longitudinal direction.

21. Irradiation arrangement according to one of claims 12 to 20, characterized in that the fluorescent film (5) is fitted to the enveloping body (7) in the form of an interchangeable frame.

22. Irradiation arrangement according to claim 21, characterized

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in that the films (5) with different doping are wound up on dispensing and take-up rollers (6).

23. Irradiation arrangement for therapeutic purposes according to one of claims 12, 15 or 16, characterized in that a fluorescent film (5) according to one of claims 1 to 11 is wound around the part of the body to be treated in the manner of a bandage.

24. Method for producing a fluorescent film according to claim 2, comprising the following method steps:

- a) mixing a hydroxyl polydiorganosiloxane with an organohydrogen siloxane,
- b) adding luminescent particles, and
- c) generating a chemical reaction by means of a platinum catalyst at room temperature.

25. Method for producing a fluorescent film according to claim 24, characterized in that hydroxyl polydiorganosiloxane comprises various polymers with a minimum viscosity of 1000 centipoise at 25°C.

26. Method for producing a fluorescent film according to claim 25, characterized in that the hydroxyl polydiorganosiloxane is formed as hydroxyl polydimethylsiloxane, its copolymers, phenylmethylsiloxane and/or polymethyl-3,3,3-trifluoropropylsiloxane.

27. Method for producing a fluorescent film according to claim 24, 25 or 26, characterized in that the organohydrogen siloxane is formed as silicone with at least 2 silicon-bonded hydrogen atoms per molecule.

28. Method for producing a fluorescent film according to claim

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27, characterized in that the organohydrogen siloxane comprises homopolymers, copolymers or mixtures thereof.

29. Method for producing a fluorescent film according to one of claims 24 to 28, characterized in that the platinum catalyst comprises a platinum chloride, platinum salts or chloroplatinic acid.

30. Method for producing a fluorescent film according to claim 29, characterized in that the chloroplatinic acid is in the form of a hexahydrate or in anhydrous form.

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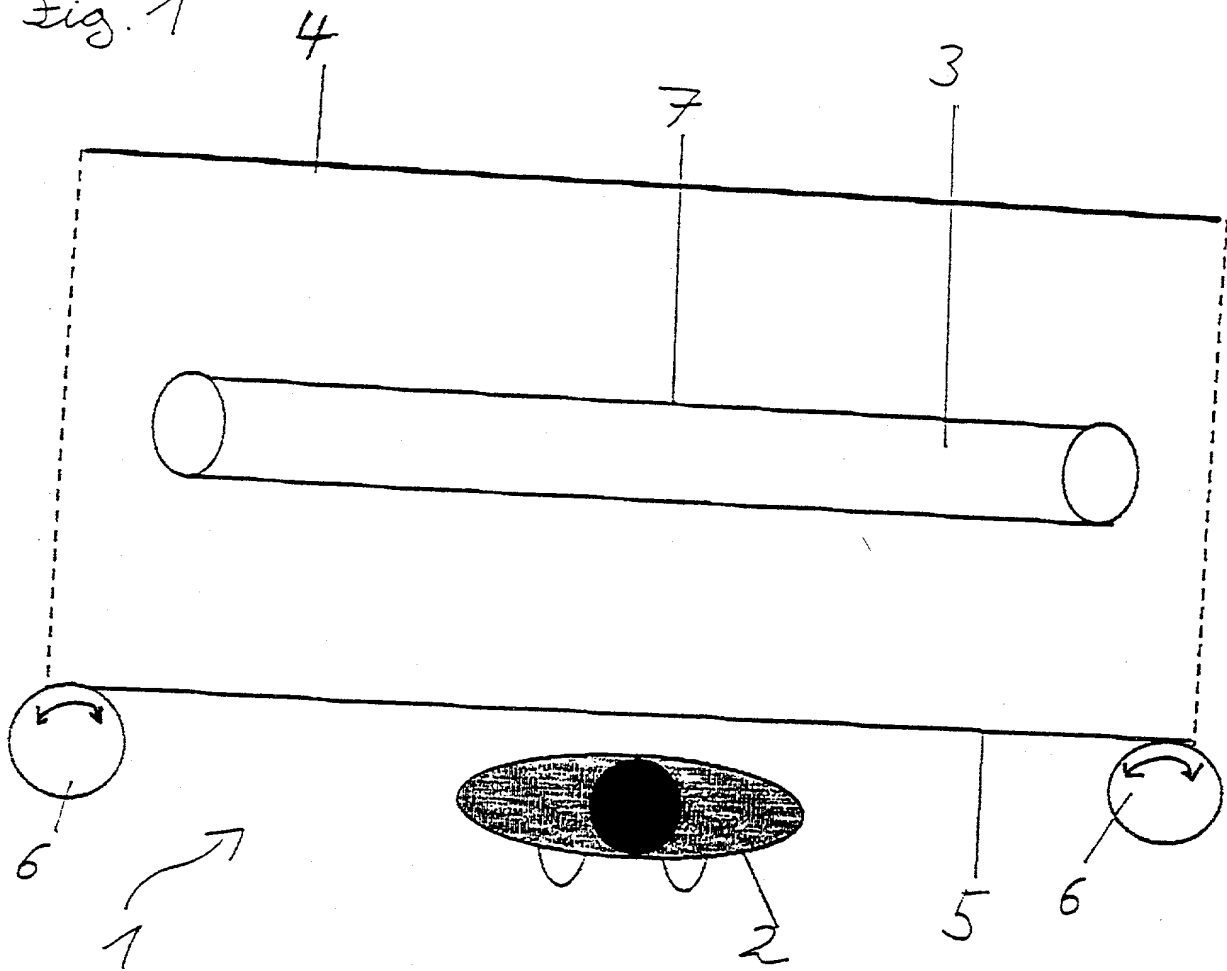
Abstract

The invention is directed to a fluorescent film (5), particularly for use with a low-pressure discharge lamp (3). The fluorescent film (5) is formed as a silicone elastomer in which the luminescent particles are embedded.

(Fig. 1)

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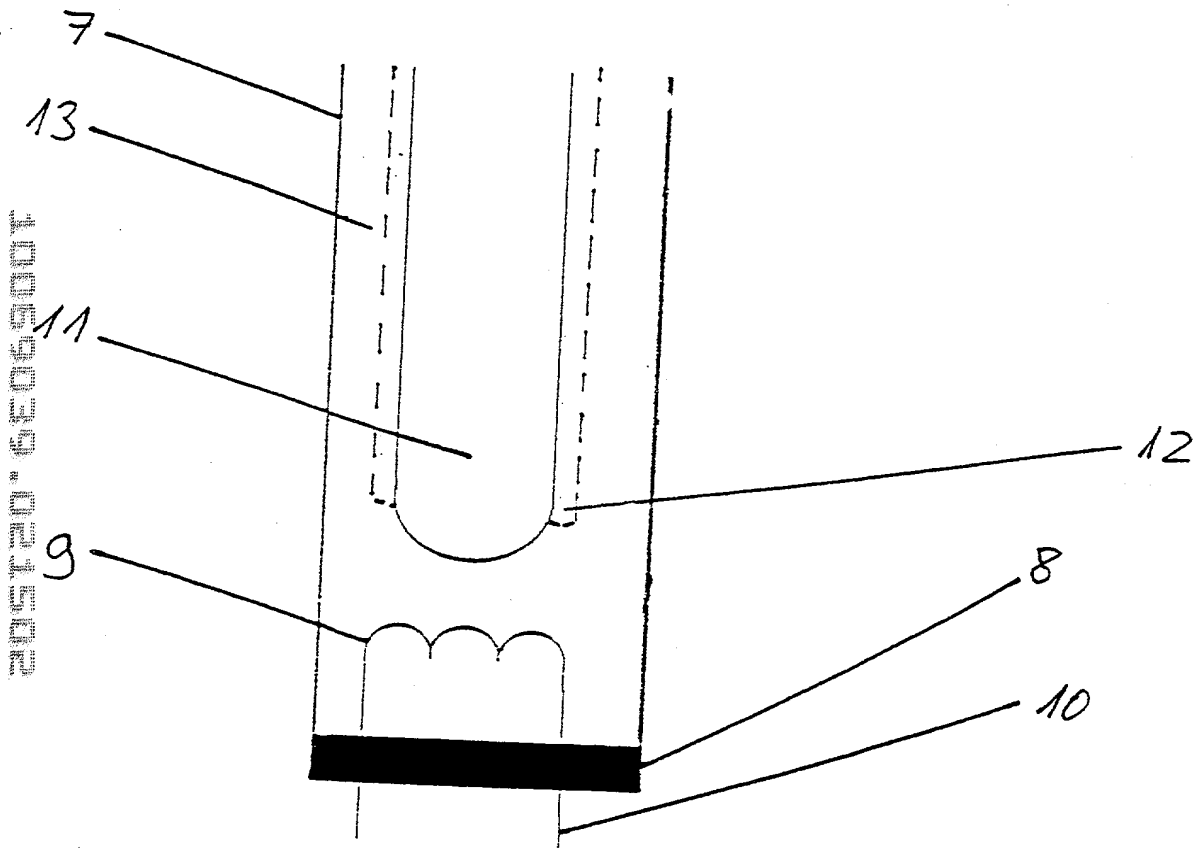
Fig. 1



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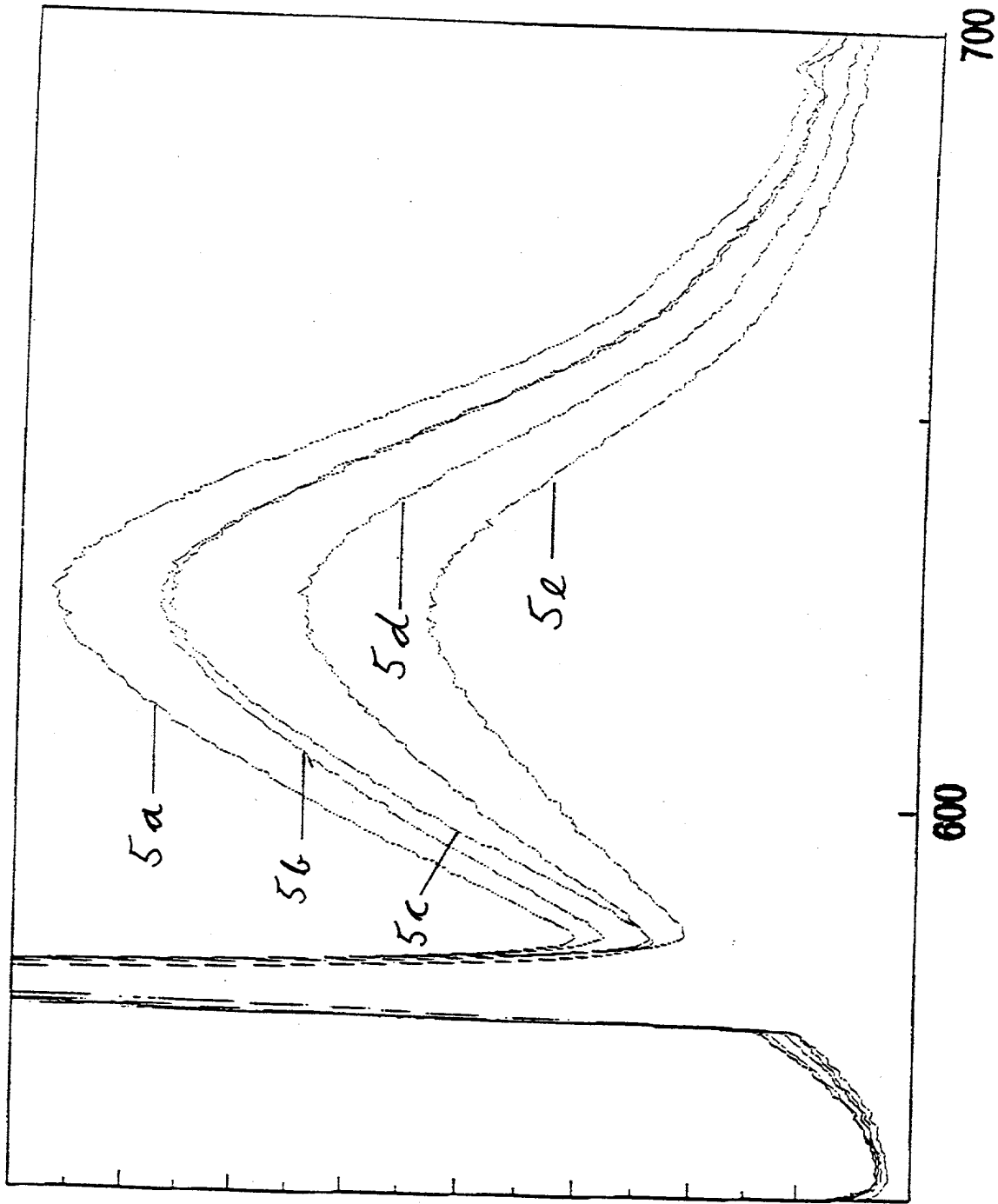
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Fig. 2



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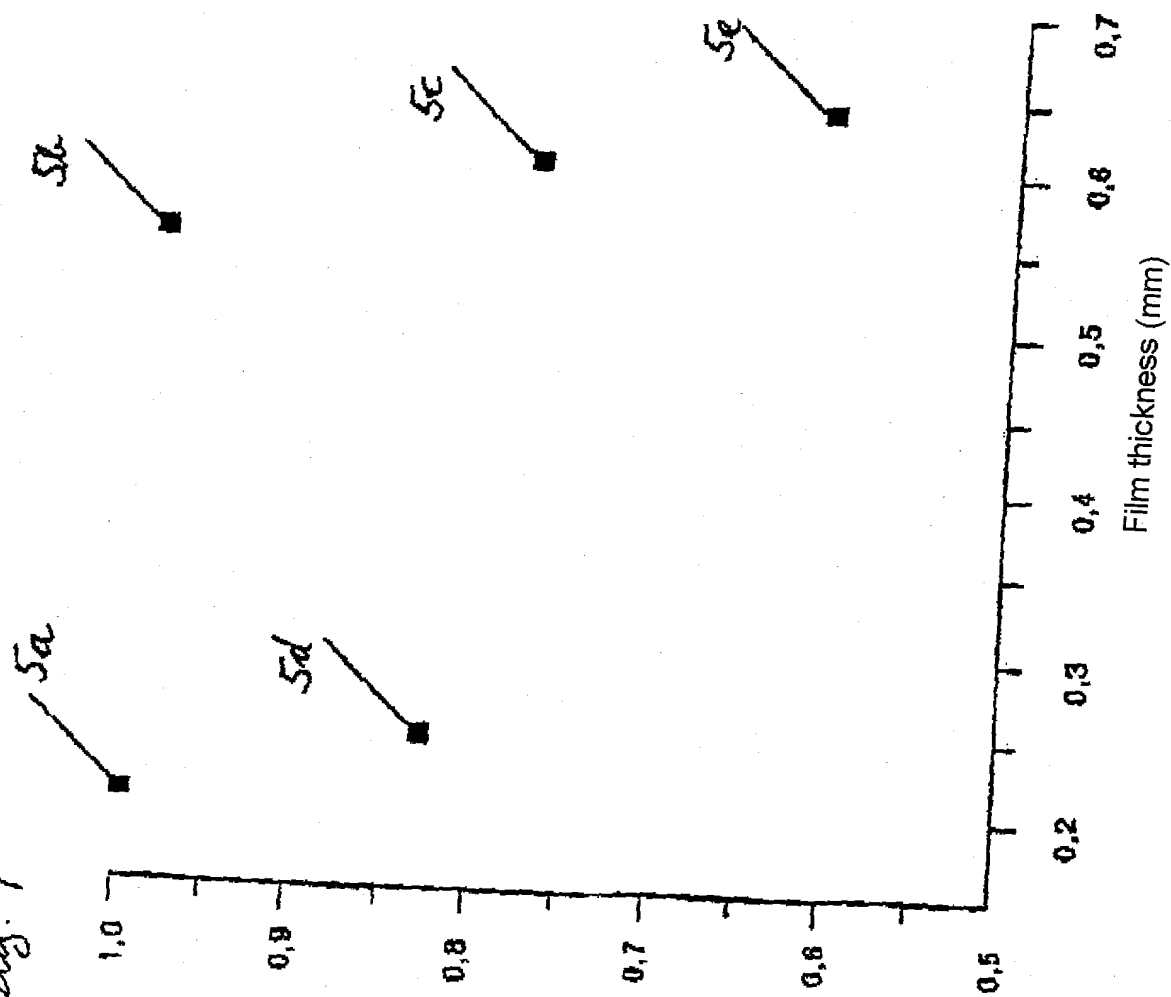
Fig. 3



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Fig. 4



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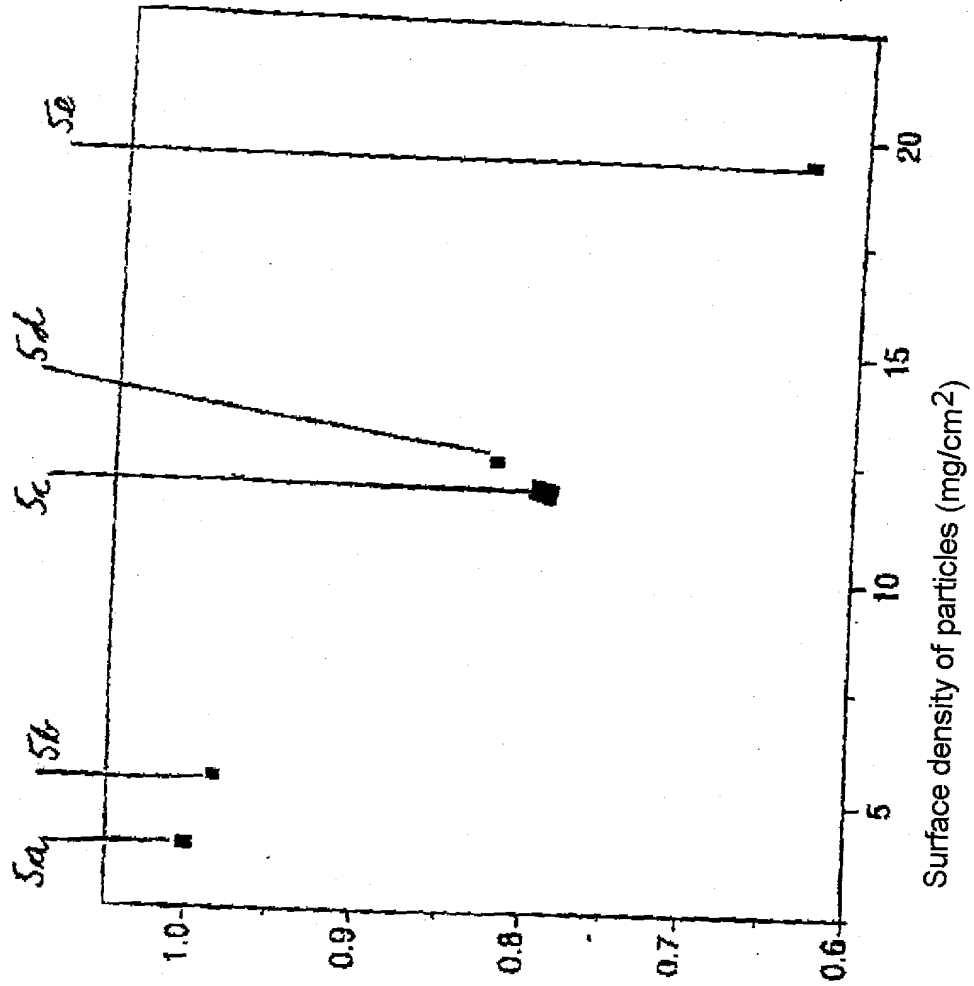
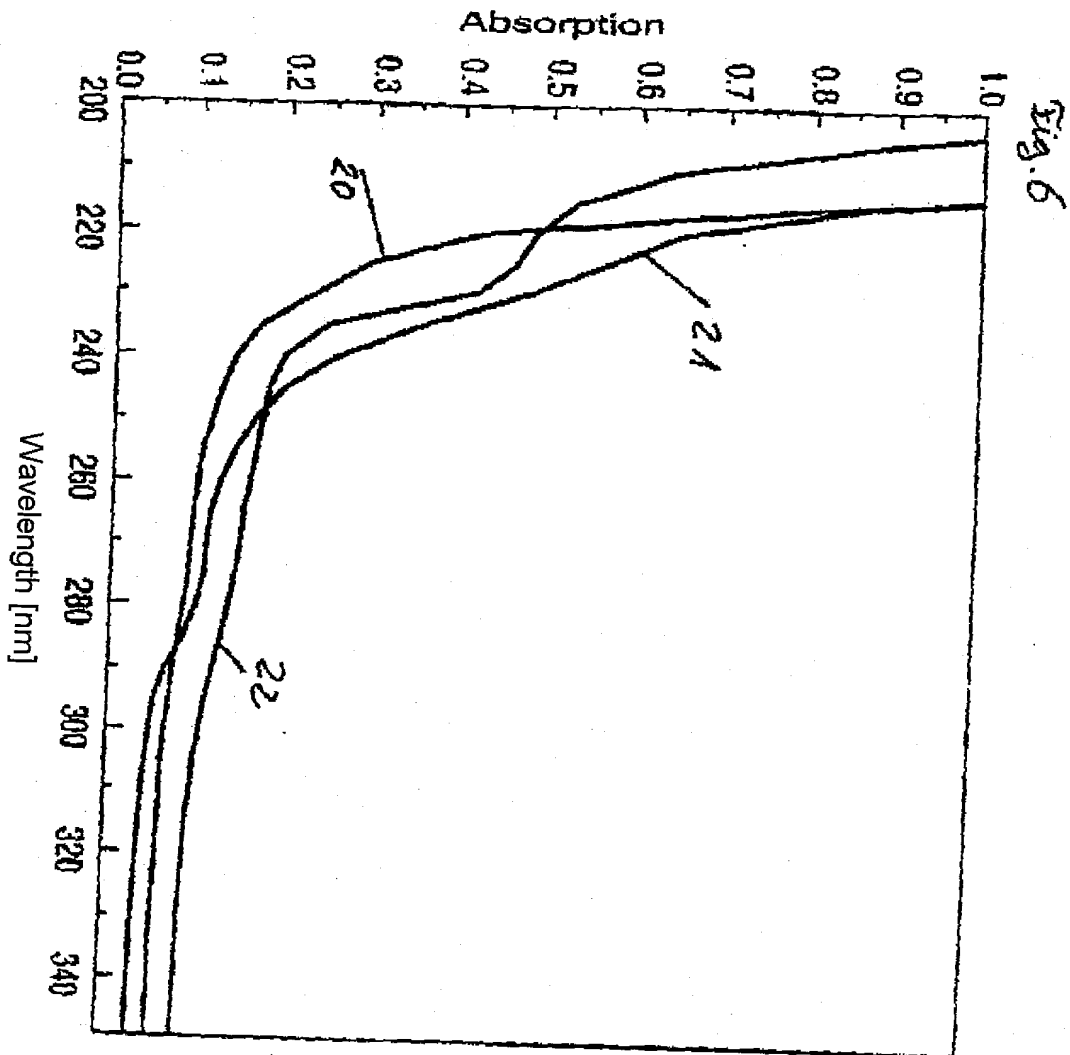


Fig. 5

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COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY
Includes Reference to PCT International Applications

Attorney's Docket
No.4070-63PUS

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

FLUORESCENT FILM

the specification of which (check only one item below)

☐ is attached hereto

☐ was filed as United States application

Serial No.

on

and was amended

on (if applicable).

☒ was filed as PCT international application

Number PCT/DE00/03155

on 7 September 2000

and was amended under PCT Article 19

on (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of the application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

PRIOR FOREIGN/PCT APPLICATIONS AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:

| Country (if PCT, indicate "PCT") | Application Number | Date of Filing (day, month, year) | Priority Claimed Under 35 U.S.C. 119 | |
|-------------------------------------|-----------------------|--------------------------------------|--|-----------------------------|
| Germany | 199 46 125.2 | 20 September 1999 | <input checked="" type="checkbox"/> YES | <input type="checkbox"/> NO |
| PCT | PCT/DE00/03155 | 7 September 2000 | <input checked="" type="checkbox"/> YES | <input type="checkbox"/> NO |
| | | | <input type="checkbox"/> YES | <input type="checkbox"/> NO |
| | | | <input type="checkbox"/> YES | <input type="checkbox"/> NO |
| | | | <input type="checkbox"/> YES | <input type="checkbox"/> NO |
| | | | <input type="checkbox"/> YES | <input type="checkbox"/> NO |

Combined Declaration for Patent Application and Power of Attorney (Continued)
(Includes Reference to PCT International Applications)

Attorney's Docket
4070-63PUS

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application:

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. 120:

| U.S. APPLICATIONS | | | STATUS (check one) | | |
|---------------------------------------|------------------|---------------------------------------|--------------------|---------|-----------|
| U.S. APPLICATION NUMBER | U.S. FILING DATE | | PATENTED | PENDING | ABANDONED |
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| PCT APPLICATIONS DESIGNATING THE U.S. | | | | | |
| PCT APPLICATION NO. | PCT FILING DATE | U.S. SERIAL NUMBERS ASSIGNED (if any) | | | |
| PCT/DE00/03155 | 7 September 2000 | | | x | |
| | | | | | |

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith (*List name and registration number*)

MYRON COHEN, Reg. No. 17,358; THOMAS C. PONTANI, Reg. No. 29,763; LANCE J. LIEBERMAN, Reg. No. 28,437; MARTIN B. PAVANE, Reg. No. 28,337; MICHAEL C. STUART, Reg. No. 35,698; KLAUS P. STOFFEL, Reg. No. 31,668; EDWARD WEISZ, Reg. No. 37,257; VINCENT M. FAZZARI, Reg. No. 26,879; JULIA S. KIM, Reg. No. 36,567; ALFRED FROEBRICH, Reg. No. 38,887; ALFRED H. HEMINGWAY, JR., Reg. No. 26,736; KENT H. CHENG, Reg. No. 33,849; YUNLING REN, Reg. No. 47,019; ROGER S. THOMPSON, Reg. No. 29,594; BRICE FALLER, Reg. No. 29,532; DAVID J. ROSENBLUM, Reg. No. 37,709; TONY CHEN, Reg. No. 44,607; ELI WEISS, Reg. No. 17,765.

Send correspondence to:

Thomas C. Pontani
Reg. No. 29,763
Cohen, Pontani, Lieberman & Pavane
551 Fifth Avenue, Suite 1210
New York, New York 10176

Direct Telephone calls to:

(name and telephone number)
Thomas C. Pontani
(212) 687-2770


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|-----|------------------------|--|--|---|
| 201 | FULL NAME OF INVENTOR | FAMILY NAME <u>CONRADY</u> | FIRST GIVEN NAME <u>Jürgen</u> | SECOND GIVEN NAME |
| | RESIDENCE, CITIZENSHIP | CITY <u>Berlin</u> | STATE OR FOREIGN COUNTRY Germany <u>DEX</u> | COUNTRY OF CITIZENSHIP Germany |
| | POST OFFICE ADDRESS | POST OFFICE ADDRESS <u>Ribnitzer Strasse 41</u> | CITY <u>Berlin</u> | STATE & ZIP CODE/COUNTRY Germany 13051 |
| 202 | FULL NAME OF INVENTOR | FAMILY NAME | FIRST GIVEN NAME | SECOND GIVEN NAME |
| | RESIDENCE, CITIZENSHIP | CITY | STATE OR FOREIGN COUNTRY | COUNTRY OF CITIZENSHIP |
| | POST OFFICE ADDRESS | POST OFFICE ADDRESS | CITY | STATE & ZIP CODE/COUNTRY |

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(Includes Reference to PCT International Applications)

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| 2 0 3 | FULL NAME OF INVENTOR | FAMILY NAME | FIRST GIVEN NAME | SECOND GIVEN NAME |
| | RESIDENCE, CITIZENSHIP | CITY | STATE OR FOREIGN COUNTRY | COUNTRY OF CITIZENSHIP |
| | POST OFFICE ADDRESS | POST OFFICE ADDRESS | CITY | STATE & ZIP CODE/COUNTRY |

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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|--|---------------------------|---------------------------|
| SIGNATURE OF INVENTOR 201  | SIGNATURE OF INVENTOR 202 | SIGNATURE OF INVENTOR 203 |
| DATE 24.07.2022 | DATE | DATE |

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